

Improving the Management, Operations and Efficiency of Utility Infrastructure Systems

As a new system of local government evolves in Romania, local government officials face new responsibilities and challenges. This report is intended to help mayors and other local government officials improve the management and operation of utility infrastructure systems. It provides practical suggestions that can be implemented within the existing legal and regulatory framework. Also, it reports on the infrastructure improvement program now underway in Craiova. The report was prepared by the International City/County Management Association (ICMA) with the assistance of the Federation of Municipalities. Funding for the report was provided by the United States Agency for International Development (USAID).

Summary

Water, canalization, solid waste collection and disposal and district heating services are managed and operated by public corporations (i.e. *Regii Autonome*) which are subordinated to local government, either the principal city in the Judet or the Judet council. The allocation of responsibilities between the different levels of government and between Regii and local government are being reconsidered. It is likely that mayors and city councils will be given increased authority over the planning, management, financing and construction of infrastructure systems. Because the services provided by the infrastructure systems are critical to the quality of life in each city and because such services constitute an important element of local budgets, the Mayor should begin to develop a strategy and plan to improve his city's infrastructure systems. Because the Mayor is responsible to the citizens, who determine if the infrastructure services are adequate, it is essential that the Mayor take a leadership role in the strategic planning and implementation of these new ideas.

Implementing the specific suggestions for improvement in the basic infrastructure services described in this report will reduce the cost of service, improve the level of services that are provided and send a positive message to potential investors and businessmen. An outline of general principles that can be initiated to improve the management and operations of local infrastructure systems follows, as well as a case study describing the infrastructure improvement program that is now underway in Craiova.

The Definition of Infrastructure

Infrastructure is the system of facilities and equipment which provide the essential services necessary for the economic development, public health and safety of the community. The infrastructure system is divided into the following specific areas of service:

Water Supply, Delivery and Treatment Systems--These facilities make up the entire system that takes water from the source and ultimately delivers it to the community. After the water is removed from the source and treated it is delivered to the community through a series of transmission and distribution lines and storage tanks. Individual lines go to each customer, and there should be an individual meter that records water used by the customer.

Canalization (sewage collection and treatment) Systems--These facilities collect wastewater from each customer and deliver it to a main collector or treatment plant for treatment and ultimate disposal. If there is no treatment facility the wastewater is discharged directly to a surface water course or a drainage area. The main feature of a canalization system is the collector that removes the sewage from the immediate area. Most systems will collect excess storm water as well as sanitary water from individual customers.

Solid Waste Collection and Disposal--Solid waste is normally collected in wagons or trucks and carried to an

incinerator or solid waste landfill for ultimate disposal. The waste is normally reduced to approximately 10% of the original volume. Most communities use landfilling as the primary method of disposal. In the landfill method, solid waste is covered to protect it from animals and to avoid disease transmission.

District Heating--This activity provides the heat for buildings and hot water in the community. Because this system relies on the water supply and delivery system to make up any losses from usage or leakage, it is essential that the water system provide 24-hour service. The heating system receives the majority of make up heat from a waste heat source associated with the local electric generation plant. Areas served that are beyond the central heating generating plant heat loop are provided hot water from individual boilers which are normally gas fired. Because the water has been treated and heated, leakage in either heat loop system is very expensive.

Action Plan for Infrastructure Improvements

An action plan for infrastructure improvements will have five components, based upon the successful program initiated by the Mayor of Craiova:

Organization/Policy Decision-Making Authority--The key managers of the Regia who provide the infrastructure services should be identified, and a committee should be formed to make improvements in the service levels provided to the citizens. The committee should select a project manager, who will need to have the authority to act on behalf of the Mayor and the Regia.

System Survey--It is essential to evaluate each infrastructure system area. This will determine current service levels and define areas of concern that will form the basis for a work plan. At the conclusion of the initial assessment, the committee will meet to determine the critical issues that will receive the initial effort.

Action Plan Development--The committee will prepare an action plan which will define the action steps necessary to begin the improvement process. Each action step will have specific assignments and schedules that will focus the efforts of the work groups on the activities which will have the best results in the shortest amount of time.

Project Prioritization--There is a need to determine the improvements that are most cost effective and easiest to implement.

Project Audit--When the action plan is completed, the policy decision group will evaluate the results. Based upon the results, there may be additional activities that are cost justified. By evaluating the action plan as it is completed, there is a positive control system in place ensuring that the most important improvements are made to the infrastructure systems.

Other Suggestions for Improving Infrastructure Systems

It is recommended that cities focus their efforts in the following areas:

Revenue collection and management--Form a team of specialists that will define the revenue requirements to repay a loan for improvements in each area of infrastructure. In most cases it will be necessary for the City to demonstrate that it has the financial management capability to administer a loan repayment program used to finance major infrastructure improvements.

Metering (water, building heat, water heating)--Purchasing potable water and district heating system meters will form the basis for an effective water conservation program. It is always more cost effective to conserve resources like district heating water than to increase the delivery capacity to make up for system losses.

Water conservation, education and recycling--Begin an education and technical assistance program to encourage individual families to reduce the amount of water that they use. A major program that focuses on the large industrial users will result in significant improvements in peak hour water and heat usage. Conservation and education materials should be provided, to include plumbing supplies, low water shower heads, toilet repair kits, faucet repair kits and literature for implementing the program.

Personnel training--This activity will focus on training related to equipment and chemical usage and will improve efficiency in the treatment plants and delivery systems. This activity will focus on training in the plants and the heating stations based upon the individual needs of the community.

Strategic planning--This activity is essential for each community to be able to determine its focus for infrastructure improvements. As financial resources are limited, strategic planning is very important. Priorities must therefore be established and cost effectiveness of alternatives must be determined. Based on this analysis, the Mayor and council must agree on which projects should be funded first.

Electric water heating at individual locations--This program requires that all new buildings and facilities provide their own units. This recommendation can be implemented through the ordinances of the City.

Fixed assets and operating procedures documentation--A program that defines the number and book value of each individual asset item will be of great assistance when improvement projects are planned for the system. With this listing it will be easy to know exactly where the equipment and facilities are. Each operating procedure should be reviewed and documented to ensure that each significant activity is performed in the most cost effective manner possible. After these procedures are written they should be reviewed once per year to ensure that they are meeting the service delivery levels defined by the Mayor.

Initiate a refuse composting program--This effort should begin with an education program that informs the citizens of the benefits of refuse composting. The cost of services will be reduced and the quality of the compost produced will increase if participants place refuse at a collection point in a specific manner and form. In most cases, citizens with individual homes and gardens will be able to establish their own compost program and reduce the quantity of waste that is placed out for collection. A community based program for composting will reduce the quantity of waste collected from participating homes by up to 60%.

Case Study of Craiova's Improvement Program

The City of Craiova evaluated the services that it was providing to the citizens and determined that the existing infrastructure was not meeting the basic requirements of the community. Improvements in the economic development of the community were not possible unless the infrastructure and associated services were improved. Two primary Regii perform these services. The "Regia Autonomia Apa Canal Termoficare" focuses on the water, canalization (sewer) and heating services. The "Regia Autonomia a Domeniului Public" has a primary focus on street cleaning, solid waste collection and disposal services. Money for capital improvements has been allocated through a system managed from the Judet.

Under the current system, the City could not provide 24-hour water to a majority of the community. This resulted in interruptions in the delivery of building heat and hot water. Because the water supply was intermittent, the customers would leave the faucet open or fill their bathtubs every time the water was on. This resulted in a large demand for water and a significant loss of available water for customers throughout the system.

Over the years, the canalization system clogged with debris and the main line has become completely plugged. This resulted in the discharge of untreated wastewater in highly populated areas of the City. The City is waiting for a treatment plant to be completed that would properly process the wastewater generated. It is questionable if

the facility will receive funding in the near future.

The City has a solid waste incinerator which was designed to operate at a rate of 100 tons per day. Due to design problems, the unit is operating at only 100 tons per month. This has resulted in a backup of refuse at the site and a very high operating cost per ton. The landfill that receives the solid waste is not isolated from the public, and the refuse is not covered on a daily basis.

The City is concerned that the method of replacing old infrastructure systems will not meet the requirements of the community. The Mayor is interested in establishing new methods and procedures that will qualify the City for loans and grants from outside funding agencies. The Mayor is pursuing the establishment of modern system management procedures in order to ensure that the infrastructure systems and services are operated in a cost effective manner.

Results Achieved from Technical Assistance to Craiova

1. Improvements related to the water supply have been made and the amount of water available for delivery has been increased by 350 liters per second. Operating methods in the filtration plants have been standardized to eliminate waste and improve service levels.
2. The distribution system has been evaluated to determine if there is a better way to deliver water to areas of the community with intermittent service.
3. The canalization system has been evaluated to determine if the main line can be cleaned to discharge the sewage farther from the population concentration in the City.
4. The solid waste incinerator has been shut down to reduce the cost of solid waste disposal. The landfill has been isolated to protect the public from potential transmission of disease from the solid waste. Personnel from the incinerator are being reassigned to improve the use of containerized service in the community.
5. The heating exchanger units in the heating system have been tuned to ensure the maximum transfer of energy to the heat distribution system. This will improve the amount of heat delivered to the general public and reduce the overall cost of operation.
6. Emergency repair crews have been established to immediately respond to a leak in the water and heating distribution systems rather than repair the leaks after several days of product loss.

Action Steps and Technical Program to Improve Infrastructure Systems

Craiova is in need of further technical assistance in order to continue to improve infrastructure systems. Each Mayor can review these issues specific to Craiova and the work plan it developed and determine if any common issues may apply to the infrastructure and services in his own community.

Building Heating

1. Perform an inventory of the number and size of meters required to equip the system. This program would start with the largest users.
2. Survey each individual heat loop for leaks by providing a pressure test on the system in a static condition. This test could also be performed by monitoring make up water required on each heat loop. Analysis of heat balance would also be performed.

3. Evaluate the building heating system make up water plumbing to see if non-potable water could be provided as make up water for this system. The only reason the heating system was turned off twice per day is because the water supply to the heating system was turned off due to a lack of source capacity.
4. Inventory all gas fired boiler centers to define the size and type of meter that is required. Install pressure and temperature meters to assist the operators in controlling the balance of heat processed through the system.
5. Establish an emergency repair team to repair breaks and leaks as soon as they are discovered.
6. Establish operating standards in each heating center to control the delivery of heat and ensure that the individual center is providing heat which is consistent with the standards of the Regia. Require operators to maintain logs.

The result of these recommendations would be improved service and reduced leakage. To fully implement this program, the Regia should consider assigning an engineer with several technicians that would head up assessment teams to define service pipes to individual buildings (heat loops).

Water Supply

Specifics of such a water conservation and consumer education program focus on the following elements:

1. Establish a water conservation and customer education program. The Regia should assign an engineer to head up the program. An educator and a journalist are essential to the success of the program. In addition, a financial analyst should be hired to determine the most cost-effective rate structures.
2. Obtain materials from successful conservation programs in the United States. The result of this program will be the best return on investment of any of the recommendations mentioned. Without such a program the water system can not meet the objective of providing a safe and adequate supply of economical water which is available 24 hours per day.
3. Manage source water supply in order to provide the least-cost, most available water first.
4. Reduce wasted water in well and treatment plant operations, as well as reduce internal plant recycle losses. Industrial users might be able to use raw water or partially treated water, thereby enabling the increased capacity to be used to deliver additional potable water for higher quality uses. Also, analyze filter backward practices.
5. Encourage parents and children to stop wasting water in normal daily life through customer and school education programs. Hand out written material on water storage other than the bath tub or include with the bill. This conservation program can begin immediately with the next billing.
6. Provide customers with 24-hour per day service and leak detection surveys in order to facilitate repairs and reduce wasted water on off-peak periods. Assist industrial and commercial users to reduce wasted water and control their cost of business. For example, commercial users like greenhouses can be placed on an off-peak schedule of water use, thereby reducing delivery capacity requirements.
7. Evaluate customers on the long transmission lines into the City to see if they can be served by a local source. Additional local storage may provide water to these local users on an off-peak basis at a reduced rate.
8. Use pressure zone management to reduce the amount of pumping required in the higher elevations of the

City.

9. Repair and replace meters, beginning with all commercial and industrial customers. It is common for such costs to be paid by the customer. A City ordinance to this effect would provide the needed funds.
10. Require meter installation for all new building renovation and occupancy before the space is placed in use by the business.
11. Evaluate all system storage to ensure that it is operated at maximum effect. An engineering specialist should review operating practices with on site personnel.
12. The Mayor and the Regia should define water system service standards and seek citizen support for the changes in rates to achieve these service standards.
13. Schedule a strategic planning session to focus resources on programs that will meet the mission of the water system.
14. Plan, design and construct long-term capital programs which are financed through a combination of loans, investment capital and rates. Programs for increased reliability and water quality safety should be the primary focus. Terminal storage and main transmission line reliability should be a high priority.

Sanitation/Sewer and Wastewater Treatment

1. Inspect and clean the existing lines to restore the dry weather sewer flow capacity. This will remove the pollution from the population in the neighborhood where the drainage canal is located.
2. The Mayor and the Regia should establish a program with the Biology Department of the University. Under this program, the University could assist in the evaluation of point and non-point source pollutants in the community.
3. Establish an industrial education and monitoring program to ensure that industry is not creating environmental problems which will adversely effect the community. This program can be funded through a fee charged to each industry. The Regia should assign a chemist who will survey each industry and maintain records on its operation as it affects discharge to the air or water in the community. In addition to this program, the chemist should work with the health and regulatory officials to monitor laws which limit the discharge of pollutants from the community.

Solid Waste

1. Cover refuse daily at the landfill. Provide cover material for the landfill. Fill in low standing water areas near the landfill site. Remove scavengers from the site. If the City operates an incinerator, evaluate the performance of this unit in comparison to the cost of sending the refuse to the landfill.
2. Have two shifts for container truck operation and one shift for maintenance. Assign maintenance of specific units to same mechanic.
3. Select a staff technician who can work with a university and a journalist on the establishment of a home compost program. This will eliminate up to 60% of the solid waste from individual households.
4. Select a staff financial specialist who will evaluate and define the market for recyclable items. A market for recycled items is essential to the success of the program. Start with easily recycled, high value items

like aluminum cans.

5. Begin to track the cost of the solid waste program. Determine the various aspects of the program and consider the impact of charging a fee for the service provided.
6. Set up a route planning team. This effort will ensure that the most efficient route is followed to reduce travel time, fuel use and cost.
7. Evaluate a route incentive plan where work teams are allowed to go to other jobs when their route is complete. Under this program the route team would advise residents on their route how to place refuse out for collection in such a way that collection efficiency would be increased. Also, consider having the route teams deliver filled trailers to a central location where a train of trailers would be pulled to the landfill with one tractor or a modified truck unit.
8. Establish standards for placing refuse out for collection. This might include bundling and cutting materials to length, and requiring refuse to be on racks or in containers. Set a fee for excess volume.
9. Modify building association refuse chutes to place refuse in containers rather than on the ground. This will reduce diseases and rodent problems.

Hot Water Supply

Because the system is operated under the same approach as the building heating system, the program for improving the hot water supply includes the same elements as the improvement program for building heating.

1. Require all new commercial and industrial buildings to install their own hot water system, due to the inherent inefficiency of the hot water supply system design. A program to phase out existing commercial and industrial service should be considered on a sector by sector basis.
2. Meet with the CET to develop a financing system where electric hot water heating units could be financed and installed via the electric bill. With production levels down, CET will have surplus electricity that they could sell for heating water.

Conclusion

The experience in Craiova demonstrates that cities are capable of identifying the infrastructure improvements which are required to meet the needs of the community. Several major improvements have been made to the infrastructure services in Craiova, and staff are continuing to work on longer-term issues. With funding from outside donors and additional technical assistance, the infrastructure system problems in Craiova can be resolved. In every city, the Mayor, working in close association with the Regia, can make significant improvements in the management and operating efficiency of its infrastructure systems.